

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Promoting More Efficient Use of Spectrum)	ET Docket No. 10-237
Through Dynamic Spectrum Use)	
Technologies)	

REPLY COMMENTS OF VERIZON WIRELESS

Verizon Wireless hereby submits its reply to comments submitted in response to the Federal Communications Commission’s (“FCC” or “Commission”) Notice of Inquiry (“NOI”) in the above-captioned proceeding regarding dynamic spectrum use technologies.¹

The record in this proceeding unequivocally demonstrates that third party deployment of devices using dynamic spectrum technologies in licensed CMRS technologies would undermine existing and future use of these bands.² As detailed below, third-party dynamic spectrum sharing in licensed CMRS bands can result in interference to incumbent licensed services. In particular, spectrum sensing (including cooperative spectrum sensing), geolocation, interference temperature, and policy radio concepts are unworkable in the CMRS bands. Instead, the Commission should focus its efforts on continuing to monitor the development of these

¹ *Promoting More Efficient Use of Spectrum Through Dynamic Spectrum Use Technologies*, Notice of Inquiry, 25 FCC Rcd 16632 (2010).

² *See, e.g.*, Microsoft Comments at 2 (“Notably, because Commercial Mobile Radio Service (CMRS) providers intensively use their spectrum, mandated access by smart radios would not be appropriate in spectrum bands licensed for their exclusive use.”); T-Mobile Comments at 6 (“bands used for CMRS are less suitable for sharing given existing technology.”); TIA Comments at 6 (“spectrum dedicated for wide area mobile broadband network use must remain free from sharing requirements.”).

technologies and promoting experimentation of these technologies in existing unlicensed spectrum and spectrum bands that are currently allocated for limited uses.

Commenters in this proceeding show that “the cellular industry has excelled in the efficient utilization of spectrum.”³ As CTIA notes, “U.S. mobile wireless providers are the most efficient users of spectrum worldwide.”⁴ And this efficient usage is only increasing.⁵ As wireless providers transition to LTE, the spectral efficiency of their networks will increase from 0.5 bps/Hz/sector to 1.5 bps/Hz/sector, and possibly to 2.4 bps/Hz/sector with more advanced Multiple Input Multiple Output antenna configurations.⁶ As a result, carriers are able to provide mobile services that require always-on connectivity (*e.g.*, email and web browsing) and are sensitive to delays and latency (*e.g.*, streaming video, high-quality voice telephone, and online gaming) to hundreds of millions of consumers nationwide. But these services “require a managed network using licensed spectrum, not one with opportunistic access to spectrum where priority services would compete equally with secondary services for spectrum access.”⁷

Forced sharing of the CMRS bands using dynamic spectrum technologies could cause substantial interference to incumbent operations, undermining carriers’ provision of existing and

³ Ericsson Comments at 3. *See also* CTIA Comments at 4-7; T-Mobile Comments at 2; Microsoft Comments at 2.

⁴ CTIA Comments at 5 (“Today, U.S. carriers pack more subscribers into each megahertz of spectrum, enabling more minutes of calling and more megabytes of data usage, than the mobile providers of any other nation.”).

⁵ *See, e.g.*, Ericsson Comments at 9 (“Year after year, advanced technologies have enabled increasingly efficient use of spectrum in the marketplace. Network operators have repeatedly deployed new technologies to improve their efficiency and carry ever-increasing voice and data traffic loads.”).

⁶ *See* CTIA Comments at 6-7.

⁷ Ericsson Comments at 6.

future services as well as their efficiency developments. As Verizon Wireless demonstrated in its initial comments, “[d]ynamic spectrum access radios cannot overcome fundamental physics – noise levels and interference depend on the locations of the transmitter and receiver, and vary from one moment to the next.”⁸ Specifically, dynamic spectrum access technologies cannot correctly assess the presence of licensed CMRS traffic if there is an obstructed path, the dynamic spectrum access radio is out of range of the primary CMRS transmitter but within range of a receiver, or a licensed CMRS transmitter attempts to use the spectrum when the spectrum is already occupied by a dynamic spectrum access radio.⁹ In addition, mandatory sharing could increase the noise floor within CMRS spectrum, negatively impacting carriers’ networks and services.¹⁰ And “[n]ot knowing when and how third party users will use licensed frequencies, [CMRS] licensees would be unable to adequately design and manage their networks to avoid the potential interference from such third party users.”¹¹

⁸ Verizon Wireless Comments at 9-10.

⁹ *Id.* at 10. *See also* AT&T Comments at 11-12 (“The Commission’s own testing of dynamic spectrum use devices in the TV bands revealed significant challenges with these devices, in terms of both accurately identifying channels that are available for use and adequately protecting licensed services from interference. . . . That dynamic use technologies are insufficient to adequately protect operations in the broadcast television bands is particularly telling because, in many ways, the broadcast television band is the ‘simple’ case for policy-based sharing devices. The challenges in mobile bands are exponentially more complex, and the stakes are potentially greater.”).

¹⁰ T-Mobile Comments at 6 (“[M]odern CMRS systems using frequency reuse are ‘interference limited’ and any increase to the noise floor from any unwanted signals would cause degradation of service to customers. Thus, bands used for CMRS are less suitable for sharing given existing technology.”); Ericsson Comments at 8 (“Such sharing scenarios may also increase the noise floor within the licensee’s spectrum and, as a result, negatively affect coverage, capacity, or quality. Sharing requirements on licensed spectrum may further prevent the licensee from introducing new technologies or deploying system upgrades. Lastly, if the licensee’s spectrum is shared by a large number of sharing users, it may be impossible, as a practical matter, to reclaim exclusive use if and when harmful interference occurs.”).

¹¹ CTIA Comments at 12.

While several commenters extol the alleged benefits of certain dynamic spectrum use technologies,¹² they ignore fundamental facts about these technologies that prohibit their use in CMRS spectrum.¹³ As V-COMM concludes in its reply comments, the deployment of these technologies by third parties is untenable in CMRS spectrum due to the high risk of resulting interference. Specifically, “spectrum sensing and geolocation concepts would not work in licensed CMRS bands and would result in harmful interference to incumbent users if applied to these bands.”¹⁴ In addition, interference temperature concepts continue to be unworkable, will not enable dynamic spectrum sharing of licensed bands, and would result in increased interference levels within CMRS spectrum bands.¹⁵ Further, the use of software policy radios raises significant security concerns as their operating parameters, software policies, and radio properties could be modified in the after-market by hackers, ‘jail breakers,’ and other software-modders.¹⁶

¹² See, e.g., Google Comments at 10-12 (promoting real-time spectrum management via a database, spectrum sensing and monitoring, and interference temperature concepts); Response of xG Technology at 5-7 (supporting the development of policy radios); Shared Spectrum Comments at 20-21 (encouraging adoption of a policy-based approach to dynamic spectrum access technologies that could be applied across most, if not all, spectrum bands); Dirk Grunwald, *How New Technologies Can Turn a Spectrum Crisis into a Spectrum Opportunity*, at 25-34.

¹³ Ericsson Comments at 3 (“[T]he cellular industry . . . has utilized time, frequency, space and code domains to an extent that would be very difficult for a system of unbridled sharing to match, even if that system was aided by sensing, database, or other techniques. The cellular industry is best positioned to drive the adoption of and to satisfy the mass-market demand for mobile broadband.”). See also TIA Comments at 6.

¹⁴ V-COMM Reply Comments at 3, 6-13.

¹⁵ *Id.* at 13-17.

¹⁶ *Id.* at 26-29.

Forced sharing also would not increase spectrum efficiency in the CMRS bands. As Ericsson and others note, “[s]hared usage with services like cellular will not necessarily increase spectrum efficiency, where the demands for capacity and services have pushed the state of the technology to very high degrees of efficiencies.”¹⁷ Indeed, “interference from opportunistic sharing by unlicensed users could actually decrease spectral efficiency thereby by limiting overall network capacity.”¹⁸

Finally, forced sharing of licensed CMRS spectrum risks impeding innovation and investment by wireless providers. As CTIA notes, “where market forces already provide the framework within which providers make the most efficient use of spectrum, mandatory underlays to promote additional spectrum use would actually undermine innovation and negatively impact the quality, coverage, and capacity of today’s services to hundreds of millions of consumers.”¹⁹ AT&T similarly finds that “[b]ecause of the variety of means by which carriers can exploit their substantial spectrum investments, there are likely few opportunities for dynamic spectrum use to rationalize underused spectrum resources in these bands [and, i]nstead,

¹⁷ Ericsson Comments at 11. *See also* TIA Comments at 7; AT&T Comments at 9 (“Introduction of opportunistic devices into the licensed spectrum bands also will diminish the incentives of licensees to maximize efficiency. . . . [I]f uncontrolled opportunistic devices are introduced to the band, the efficient carrier is likely to have its excess capacity taken over by unaffiliated third party users. The consequence would be to penalize the most innovative and efficient users of radio spectrum.”).

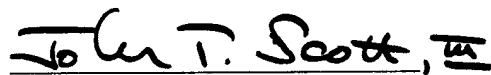
¹⁸ CTIA Comments at 11.

¹⁹ *Id.* *See also id.* at 12, citing Report of Michael L. Katz, Don’t Let Short-Term Reforms Interfere with Long-Term Policy Goals, at 18 (Apr. 5, 2004) (“the creation of significant underlay rights would very likely reduce the incentives and ability of CMRS incumbent licensees to innovate and invest. These investment and innovation distortions would harm consumers and economic efficiency.”).

introduction of these technologies in the licensed mobile bands is more likely to upset the powerful incentives that currently drive innovation in the sector.”²⁰

If the Commission wishes to promote the development of dynamic spectrum access technologies, it should maintain its long-standing, successful flexible use and secondary markets policies rather than mandate sharing of licensed CMRS spectrum. In addition, it should continue to study the development of dynamic spectrum access technologies in bands that have already been identified for such uses, and consider whether such technologies could make spectrum bands that are currently allocated for limited purposes more widely usable.

Respectfully submitted,

A handwritten signature in black ink that reads "John T. Scott, III". The signature is written in a cursive style with a horizontal line underneath the name.

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²⁰ AT&T Comments at 7.